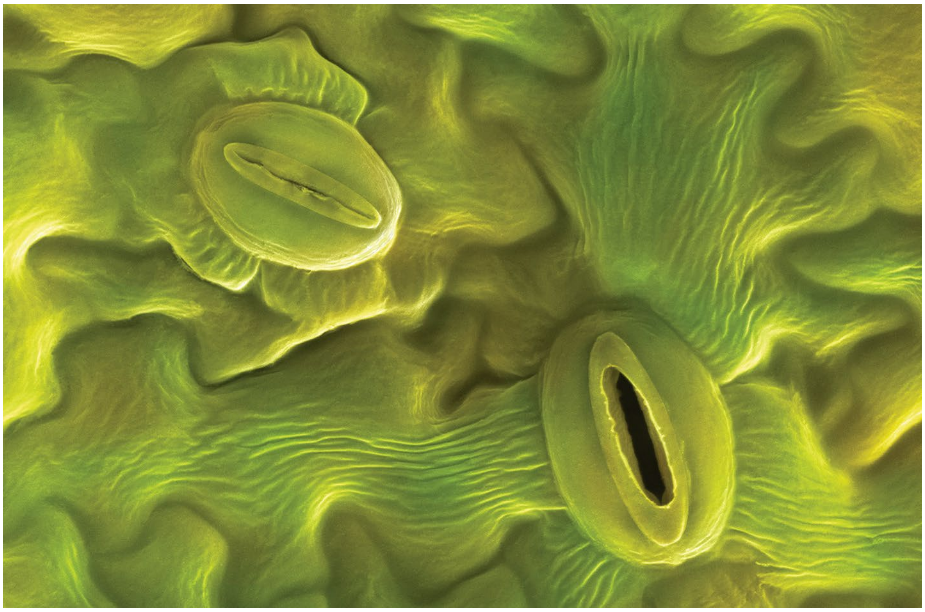
PLANT ECOPHYSIOLOGY

Stomata feel the pressure

New Phytol. http://doi.org/c2v3 (2019).



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Drought episodes are increasing in frequency and intensity as a consequence of climate change, severely impacting water balance in plants. Stomata are superficial leaf pores that regulate the trade-off between atmospheric CO_2 uptake and water loss, and so represent the ultimate boundary line for regulating water stress in plants. Understanding the drivers of stomatal dynamics is, therefore, key to predicting plant responses to forthcoming intensified drought episodes. Based on different poplar genotypes, Maxime Durand and colleagues from the INRA and the Université de Lorraine, France, have analysed the links between the speed of stomatal response and vapour-pressure deficit (the pressure the atmosphere exerts on plants to release water), irradiance, drought, stomatal morphology and water-use efficiency (the quantity of biomass produced per unit of water used).

They find a decoupled response of stomatal dynamics to irradiance and vapour-pressure deficit, being slower in the latter case, and that soil water deficit slows down this response to both factors. Their results reveal a link between stomatal morphology and dynamics, with higher densities and smaller sizes of these pores being associated with faster opening/closing responses. Particularly, they show that stomatal density is critical to understand the relationship between stomatal aperture change and conductance, and so it needs to be considered when analysing stomatal dynamics. Lastly, their results provide supportive evidence for the fact that faster stomatal dynamics are associated with higher water-use efficiency.

These findings suggest that irradiance and vapour-pressure deficit represent two uncorrelated sources of pressure that, together with increased drought, produce synergic detrimental effects against the speed of stomatal responses and water-use efficiency of drought-sensitive species. Stomatal frequencies are not only key to understand plant responses to changing CO_2 levels, but also the speed of stomatal response to drought-related factors such as irradiance, soil water deficit and vapour-pressure deficit.

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Published online: 8 March 2019
https://doi.org/10.1038/s41477-019-0390-3